Table 19: **Env**

HXB2 Location	Author Location	Sequence	Immunogen	Species(HLA)	References
Env(306–322)	gp160( )	SIRIQGPGRAFVTIGI	Vaccine	murine(H-2D^d)	[Deml (1999)]
Vaccine: *Vector/type:* recombinant protein *Strain:* LAI *HIV component:* gp160 *Stimulatory Agents:* CpG oligodeoxynucleotide, alum					
• Addition of CpG oligodeoxynucleotide to a gp160/alum vaccine given to BALB/c mice shifted the response to Th0/Th1 from Th2, but no still CTL response to this immunodominant epitope was induced					
Env( )	gp160( )		Vaccine	human( )	[Belshe (1998)]
Vaccine: *Vector/type:* canarypox prime with rgp120 boost *Strain:* MN, LAI, SF2 *HIV component:* gp120, gp41, Gag, Protease					
• The live canarypox vaccine ALVAC-HIV(vCP205) carrying MN gp120, LAI gp41, Gag and Protease, and boosted with SF-2 rpg120, was given to HIV-1 seronegative volunteers – HIV-specific Env or Gag CD8+ CTL were detected in 64% of the volunteers					
Env( )	gp160( )		HIV-1 infection	human( )	[Zheng (1999)]
• Protein delivery (gp160 LAV, p66 LAV, and p24 NY5) to human dendritic cells (DC) with liposomes provides enhanced memory CTL response relative to delivery of protein alone					
• Chloroquine administration enhanced epitope presentation, and brefeldin A and peptide aldehyde inhibitors inhibited antigen presentation, suggesting epitopes were processed by a classical proteasome pathway					
Env( )	Env( )		HIV-1 infection	human( )	[Wasik (2000)]
• HIV+ infants that progressed rapidly to AIDS had lower Th1 responses and decreased production of IL-2, as well as β-chemokines, relative to other HIV+ infants					
• No HIV+ infants had no demonstrable CTL at birth, but Th1 responses accompanied by CTL responses developed in children with slowly progressive disease, and not in rapid progressors					
• CTLp frequencies were determined by limiting dilution using autologous B cells infected with vaccinia/HIV constructs					
Env( )	gp120( )		HIV-1 infection	human( )	[Soudeyns (2000)]
• Analysis of T-cell receptor β-chain variable region repertoire indicates that antiretroviral therapy (ART) and highly active antiretroviral therapy (HAART) decrease global CD8 T-cell oligoclonality during primary HIV infection					
• A sharp decline in HIV-1 gp120-specific CTL clones was observed in HAART-treated subjects					
Env( )	Env( )		Vaccine	human( )	[Salmon-Ceron (1999)]
Vaccine: *Vector/type:* canarypox *Strain:* LAI, MN *HIV component:* gp41, Gag, Pro, V3					
• The vaccine used was a rec canarypox with HIV-1 gp120 MN, tm/gag/protease LAI (vCP205), alone or with p24E-V3 MN synthetic peptide (CLTB-36))					
• Twenty HIV negative subjects were vaccinated in phase I trial with combinations of vCP205 and CLTB-36					

- Immunization with vCP205 induced HIV-1-specific ABs to gp160, V3, and p24 antigens, and CTL immune responses against vCP205 were detected after the fourth immunization in 33% of the subjects against Env, Gag and Pol, but the CLTB-36 peptide did not produce AB or CTL immune responses against p24 or gp160

Env( ) Env( ) HIV-1 infection human( ) [Gamberg (1999)]

- 13/13 subjects with advanced HIV infections showed CD8 T-cell proliferation and differentiation of CTL *in vitro*, and six individuals showed HIV-specific responses to Gag, Pol, Env or Nef antigens
- Data suggests that the functional and genetic integrity of the CD8 T-cell repertoire (TCR betaV gene intrafamily genetic diversity) remains intact through advanced HIV infection, although HIV-specific CTL activity decreases

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Env( ) Env( ) Vaccine human( ) [Gorse (1999)]

Vaccine: *Vector/type:* canarypox prime with rgp120 boost *Strain:* LAI and SF2 *HIV component:* Env, Gag, Pro, Nef, Pro

- The vaccine used was rec canarypox expressing HIV-1 env, gag, pol, nef and protease (vCP300) with or without administration of HIV-1 SF-2 rgp120
- In vitro inducible CTL activity against HIV-1 Env, Gag, Pol, and Nef antigens was observed in 79% (15/19) of vaccine recipients
- The combination of vCP300 and vP1291 together resulted in an overall increase in CTL induction and detection sensitivity

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Env( ) Env( ) HIV-1 infection human( ) [Buseyne (1998b)]

- In infants with positive CTL responses, most responses showed cross-clade reactivity with somewhat diminished recognition of epitopes from different subtypes

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Env( ) gp120( ) Vaccine Rhesus macaque( ) [Shiver (1997)]

Vaccine: *Vector/type:* DNA *Strain:* IIIB *HIV component:* gp120, gp160

- DNA vaccinations of Rhesus monkeys with a gp120 or gp160 DNA vaccine elicited a strong CD8 cytotoxic T-cell response

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Env( ) gp160( ) polyclonal HIV-1 infection Macaca nemestrina( ) [Kent (1997b)]

- Macaques can be infected with HIV, and clear the infection within 6 months, so it is of interest to examine their initial immune response
- A strong CTL response against env, pol and gag antigens can be detected
- The CTL response peaked by 4 weeks and declined dramatically by 8 weeks
- The response in the lymph nodes and peripheral blood was comparable

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Env( ) gp160( ) Vaccine murine( ) [Kim (1997b)]

Vaccine: *Vector/type:* DNA *HIV component:* Gag, Pol, Vif, Env *Stimulatory Agents:* B7, IL-12

- A gag/pol, vif or env DNA vaccine, when delivered in conjunction with the plasmid encoding the co-stimulatory molecules B7 and IL-12, gave a dramatic increase in both the cytotoxic and proliferative responses in mice
- When IL-12 was present, CTL response could be detected even without *in vitro* stimulation

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Env( )	gp160( )		Vaccine	murine( )	[Kim (1997c)]

Vaccine: *Vector/type:* DNA *HIV component:* Gag, Pol, Vif, Env *Stimulatory Agents:* B7, IL-12

- A gag/pol or env DNA vaccine, when delivered in conjunction with the plasmid encoding the co-stimulatory molecules CD86, gave a dramatic increase in both the cytotoxic and proliferative responses in mice
- When CD86 was present, CTL response could be detected even without *in vitro* stimulation

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Env( )	gp120( )	polyclonal	Vaccine	Rhesus macaque( )	[Letvin (1997)]

Vaccine: *Vector/type:* DNA prime with rgp160 boost *Strain:* HXBc2 *HIV component:* gp160

- Vaccination of Macaques mulatta (Rhesus monkeys) with an HXBc2 env DNA prime and a protein boost elicited a T-cell proliferative response, a CTL response, and type-specific neutralizing antibodies
- Vaccinated animals challenged with SHIV-HXB2 were protected from infection

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Env( )	gp120( )	polyclonal	Vaccine	human( )	[MacGregor (1998)]

Vaccine: *Vector/type:* DNA *Strain:* MN *HIV component:* Env, Rev

- An HIV DNA env and rev vaccine given to 15 asymptomatic HIV+ individuals at three different dosages, 30, 100 or 300 ug, was safe
- The CTL response to gp120 was enhanced in 0/4 patients in the 30 μg group, 2/3 patients in the 100 μg group, and 0/3 in the 300 μg group – but the non-responding patients in the 300 μg group had a strong CTL response prior to vaccination, and the CTL results are inconclusive

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Env( )	gp120( )		HIV-1 infection	human( )	[Trickett (1998)]

- Twelve HIV-1 infected patients were re-infused with their own lymphocytes, cryopreserved from an earlier time point in the infection
- Improvement in CD4+ and CD8+ T-cells was seen in 7/12, and an increase in the CTL response to Env was seen in one patient

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Env( )	gp120( )		HIV-1 infection	human( )	[Legrand (1997)]

- Seventeen recently infected patients were tested for CTL response to HIV proteins Env, Gag, Pol, Rev, Nef, Vif and Tat
- An early response (within a month following PI) was noted in 87% of the subjects to Gag, 75% to Env, and 50% to Nef
- Early responses to Pol, Rev, Vif and Tat were rare

Env( )	gp120( )		Vaccine	human( )	[Corey (1998)]

Vaccine: *Vector/type:* vaccinia prime with rgp120 boost *Strain:* LAI, SF2, MN *HIV component:* gp160

- Vaccinia-naive subjects were vaccinated with vaccinia-gp160 LAI and boosted with gp120 SF2, LAI, MN, or 160 MN
- 26/51 had an anti-Env CTL response, and those that were boosted with gp120 tended to produce Abs that neutralized autologous laboratory strains with some cross-reactivity

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Env( )	Env( )		HIV-1 infection	human( )	[Betts (1997)]

- 6/8 individuals from Zambia infected with C clade virus had CTL that were able to make response to B clade HIV-1 IIIB vaccinia-expressed Gag, Pol and Env proteins
- A vigorous cross-clade response was not limited to a particular protein, and the level of recognition of different proteins varied among the six patients

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Env( ) Env( ) HIV-1 infection human( ) [De Maria (1997)]

- CD3+ cells that also carry a natural killer cell receptor (NKR+) can exhibit down regulation of T-cell function
- Anti-NKR IgM MAb masked this inhibitory function and increased HIV-1 specific CTL activity in phytohemagglutinin-activated PBMC cultured in the presence of IL-2 from 3/5 patients, and in one other case anti-NKR MAb brought HIV-1 specific CTL activity to detectable levels

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Env( ) Env( ) HIV-1 infection human( ) [Betts (1999)]

- This study demonstrated an inverse correlation between HIV Type I plasma viral load and CTL activity directed against HIV-1 Pol, and stronger combined effects of Pol- and Env-specific CTL, in long-term survivors (LTS) of HIV-1 infection

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Env( ) Env( ) HIV-1 infection human( ) [Buseyne (1998a)]

- This study showed a correlation between strong CTL memory and breadth of response in 7-12 month old infants and: remaining AIDS-free for the first year of life, higher absolute CD4 and CD8 cells, and lower viral load

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Env( ) Env( ) HIV-1 exposed seronegative human( ) [Goh (1999)]

- 13/37 exposed uninfected individuals with repeated high-risk sexual exposure had HIV-1 specific CTL against Env, Gag, Pol, or a combination of proteins – CTL activity was correlated with a CCR5 wildtype genotype
- In this group, the highest CTLp frequencies were directed at Gag, but the most common response was to Env and four individuals had responses to multiple HIV-1 proteins

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Env( ) Env( ) Vaccine human( ) [Evans (1999)]

Vaccine: *Vector/type:* canarypox *HIV component:* gp120, gp41, Gag, Pro, Nef, RT

- A Canarypox vaccine expressing gp120, gp41, Gag, Protease, Nef and Pol CTL epitopes gave rise to CTL that could be detected in 61% of the volunteers – responses to Gag, Env, Nef and Pol were detected 3-6 months after the last vaccination

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Env( ) Env( ) Vaccine Macaca nemestrina( ) [Kent (1998)]

Vaccine: *Vector/type:* DNA prime with vaccinia boost *Strain:* LAI *HIV component:* Env, Gag

- Priming with an HIV-DNA vaccine and boosting with a vaccinia construct induced greater levels of HIV T-cell immunity than either vaccine alone
- The proliferative response to Env and Gag after the DNA vaccination had a mean SI of 1.5-4, but after boosting with rHIV-fowlpox virus, there was a 6-17 fold increase in the mean SI for HIV Gag and Env. The T help response happened despite a decrease in antibody titers, suggesting that the Th response was primarily Th1, not Th2. The CTL response was also enhanced

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Env( ) Env( ) Vaccine human( ) [Salmon-Ceron (1999)]

Vaccine: *Vector/type:* canarypox *Strain:* MN, LAI *HIV component:* gp120, gp41, Gag, Protease

- A live attenuated canarypox vector expressing MN gp120 and LAI gp41/gag/protease could induce CTL and a lymphoproliferative response in healthy, uninfected volunteers

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Env( ) Env( ) Vaccine chimpanzee( ) [Kim (1998)]

Vaccine: *Vector/type:* DNA *HIV component:* Env, Gag, Pol *Stimulatory Agents:* CD86, CD80

- The study explores the use of co-stimulatory molecules co-expressed with an HIV-1 immunogen in a DNA vaccine to enhance the immune response – co-expression of CD86, but not CD80, dramatically increased both HIV Env and Gag/Pol specific CTL and Th proliferative responses

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Env( ) gp120( ) Vaccine Rhesus macaque( ) [Notka (1999)]

Vaccine: *Vector/type:* Semliki-Forest Virus with virus-like particle boost *Strain:* IIIB *HIV component:* gag, gp120

- Immunization of SIV Pr56Gag-derived VLPs with HIV-1 gp120 anchored on their surface induced Abs, CTL and Th responses to HIV gp120; priming with the HIV antigens in Semliki-Forest Viruses enhanced the immunological outcome
- Immunized monkeys challenged with SHIV showed a more rapid reduction of plasma viremia

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Env( ) Env( ) HIV-1 exposed seronegative human( ) [Akridge (1999)]

- This study suggests that HIV-1-resistance in exposed and uninfected individuals is not only associated with the 32-bp deletion in the HIV-1 co-receptor CCR5, but can be related to HIV-1 specific CTL immunity

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Env( ) gp120( ) HIV-1 infection human( ) [Aladdin (1999)]

- In vitro measurements of CTL-activity by Cr release assay in bulk culture showed no correlation between CTL-activity (gp120, Gag, Pol and Nef) and disease progression as measured by viral load, CD4 and time to death

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Env( ) gp120( ) HIV-1 infection human( ) [Aladdin (2000)]

- The administration of IL-2 caused an initial enhancement of CD4 cell counts that was accompanied by a decrease in CTL activity – IL-2 therapy did not reduce initial HIV viral load and viral replication was ultimately enhanced

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Env( ) Env( ) HIV-1 infection human( ) [Jin (1998a)]

- CTL precursor frequencies were determined in HIV-1 infected pregnant women, and higher CTLp frequencies to Pol and SF2 Nef, but not IIIB Nef, were found in non-transmitting mothers than in transmitting mothers – Nef CTL responses have been found in uninfected infants born to HIV+ women (Lazuriaga95);
- Very different CTLp frequencies were observed in env depending on whether IIIB, MN, RF, BK, or SF2 was used as antigen – no association between env specific CTL and transmission was observed

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Env( ) Env( ) Vaccine ( ) [Zavala (2001)]

Vaccine: *Vector/type:* vaccinia *HIV component:* Env

- This paper is a review of vaccinia in the context of vaccines strategies that use different vectors to prime and boost, and emphasizes a unique capacity of vaccinia to very efficiently boost memory T-cell responses
- HIV is discussed in the context of Gonazalo *et al.* 1999, where a V3 CTL epitope expressed in reFlu was boosted most effectively by vaccinia expressing the full Env

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Env( ) Env( ) Vaccine Rhesus macaque( ) [Akahata (2000)]

Vaccine: *Vector/type:* DNA *Strain:* ZF1 *HIV component:* complete genome

- Rhesus macaques were vaccinated by i.m. injection with naked plasmid DNA carrying an HIV-1 complete genome vaccine, strain ZF1, with a mutated zinc finger in the nucleocapsid to prevent packaging
- Env and Gag specific CTL, but no antibody responses, were induced in 2/4 vaccinated monkeys (MM145 and MM153)
- 2/4 monkeys (MM146 and MM143) produced antibodies against p24 and/or gp160, but no CTL response
- PBMC from all vaccinated monkeys produced IFN-γ, in response to HIV-1 gp160, indicating a Th response – this response was 5 times higher in MM145, the animal with the strongest CTL response
- 4 weeks post-challenge with SHIV NM-3rN plasma viral loads of both MM145 and MM153 (with a homologous Env) decreased to near or below the detection limit
- 6-8 weeks post-challenge with SHIV NM-3rN plasma viral loads of both MM146 and MM143 decreased near or below the detection limit

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Env( ) gp120( ) none HIV-1 infection human( ) [Young (2001)]

- Addition of recombinant human IL-12 (rhIL-12) to cultures increased HIV-specific lysis of HIV-Gag, Pol and gp120 vaccinia expressed antigens (11/15 tested increased lysis by > 5%) if the culture was derived from HIV+ individuals who had > 500 CD4 cells/μl
- 2/10 individuals with <200 CD4 cells/μl, and 3/10 individuals with 200-500 CD4 cells/μl, had an increase of >5% upon treatment of the culture with rhIL-12, so a few individuals in late stage disease had CD8 cells that maintained responsiveness to rhIL-12

Env( ) Env( ) HIV-1 infection human( ) [Cao (2000)]

- HIV-1 subtypes A and D dominate the Ugandan epidemic, and a vaccine trial using B clade antigen is underway – this study addresses relative levels of cross-reactive CTL responses in HIV infected Ugandans to A, D, and B clade recombinant vaccinia viruses expressing Gag, Env, Pol, RT or Nef from HIV-1 clades A, B, and D
- Proteins corresponding to the subtype of the infecting strains tended to trigger higher levels of CTL response measured by percent-specific lysis, but there was extensive inter-subtype cross-reactivity with B clade proteins and the co-circulating subtype

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Env( ) Env( ) Vaccine human( ) [AIDS Vaccine Evaluation Group 022 Protocol Team(2001)]

Vaccine: *Vector/type:* canarypox, recombinant protein *Strain:* MN (gp120), LAI (gp120, protease and gag), and SF2 gp120 *HIV component:* Env, Gag, Protease *Stimulatory Agents:* MF-59 adjuvant

- 26/42 subjects who received CP vac-env-pro vaccine had a CTL response measured by Cr-release, while only 3/17 who were vaccinated with rec gp120 had a CTL response
- A combination of a CP vac-env-pro vaccine with rec gp120 gave CD8+ T-cells in 62% of subjects, and NAbs in 91% of subjects

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Env( ) Env( ) HIV-1 infection human( ) [White (2001)]

- HIV-specific CTL activity was detected in the female reproductive tract of only 1/3 HIV-infected women who underwent a hysterectomy, although CTL could be identified in the PBMC of all three women

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Env( )	Env( )	HIV-1 infection	human( )	[Jin (2000a)]

- The CTL precursor level (CTLp) was measured in long term non-progressors (LTNP) with low viral load using limiting dilution analysis and measuring CTL against Env Gag and Pol expressed in vaccinia in autologous targets
- LTNPs have high memory CTL numbers and low viral load

Env( )	Env( )	HIV-1 infection	human( )	[Jin (2000a)]

- The CTL effector levels (CTLe) were compared in long term non-progressors (LTNP) with low viral load and in patients whose virus was well-suppressed by therapy, using a tetramer assay
- LTNPs have high memory CTLe numbers and low viral load, while HAART patients had low CTLe numbers and low viral load

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Env( )	Env( )	HIV-1 exposed seronegative	human( )	[Rowland-Jones (2001)]

- This is a review that summarizes observations about HIV-specific CTL found in the HIV-1 exposed persistently seronegative (HEPS) population
- The CTL responses assayed by ELISPOT and by CTL precursor frequencies by limiting dilution analysis indicate that CTL in HEPS individuals tend to be of a lower magnitude than in chronic HIV-1 infections – the responses in HEPS cases are below the level of detection by tetramer assays
- CD8+ CTL responses tend to be detectable in HEPS subjects only if they are recently exposed, and the response diminishes if exposure is reduced – it is not clear if there is a stable memory population in HEPS cases
- CD8+ CTL responses in the HEPS population are associated with HIV-1 specific CD4+ T-cell responses, assayed by proliferation assays, IL-2 secretion, and ELISPOT, and the authors consider the possibility that HIV-1-specific T-help responses improve the "quality" of the CD8+ response in HEPS individuals relative to HIV-1 infected individuals, who tend to have a poor HIV-1-specific T-help response
- HIV-1 specific CD8+ CTL responses in HIV-1 infected individuals show reduced levels of perforin, and the T-cells may not mature properly, and although similar studies have not been conducted in HEPS individuals this is considered as a possible difference in the CTL immune response in HEPS and HIV-1 infected people

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Env( )	gp41(842–850 IIIB BH8)	HIV-1 infection	human(B7)	[Pantaleo (1997), Soudeyns & Pantaleo(1997)]

- Clonotype-specific PCR and analysis of *in vivo* HIV-specific CTL showed that in early infection HIV-specific CTL clones preferentially accumulate in blood rather than lymph nodes and that they accumulate prior to down-regulation of virus

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Env( )	Env( )	Vaccine	murine(H-2^d)	[Ishii (1997)]

Vaccine: *Vector/type:* DNA with CMV promotor with cationic liposome *HIV component:* gp160, Rev

- pCMV160/Rev is a DNA vaccine candidate carrying gp160 and Rev linked to a cytomegalovirus (CMV promotor)

Env( )	gp160( )	Vaccine	murine(H-2^d)	[Vinner (1999)]

Vaccine: *Vector/type:* DNA *Strain:* MN *HIV component:* gp160, gp120, codon-optimized

- Mammalian codon optimization renders gp160 expression Rev independent, increases gp160 expression levels, and DNA vaccination of BALB/c mice yields a higher antibody response with an earlier onset than wild type

- Secreted gp120 gave higher antibody titers than membrane bound gp160
- In contrast to antibodies, synthetic codon-optimized DNA did not alter the CTL response, wild type genes generated equally strong CTL responses

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Env( ) ( ) Vaccine murine(H-2^d) [Kato (2000)]

Vaccine: *Vector/type:* peptide *HIV component:* V3 *Stimulatory Agents:* Cholera Toxin adjuvant, IL-4, GMCSF

- A multicomponent peptide vaccine VC1 with cholera toxin adjuvant was given to mice.
- Immunization of BALB/c mice with VC1 and CT induced a strong CTL response which was enhanced by IL-12 expressing plasmids
- Immunization with VC1 and CT resulted in HIV-1 specific IgA antibody responses, which were increased by the combination of IL-4 or GM-CSF expressing plasmids

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Env( ) gp160( ) Vaccine murine(H-2^d) [Kaneko (2000)]

Vaccine: *Vector/type:* DNA *Strain:* IIIB *HIV component:* gp160 *Stimulatory Agents:* PLG-microparticle

- A PLG-microparticle encapsulated DNA encoding gp160 was given to mice.
- Oral DNA vaccination of BALB/c mice induced mucosal and systemic gp160 glycoprotein-specific cellular and humoral immune responses, and mice vaccinated orally had higher resistance to HIV-env expressing vaccinia intrarectal challenge than mice vaccinated i.m.

Env( ) Env( ) Vaccine murine(H-2^d) [Xin (2001)]

Vaccine: *Vector/type:* adeno-associated virus (AAV) *HIV component:* Env, Tat, Rev *Stimulatory Agents:* IL-2

- An AAV vector expressing HIV-1 env, tat, and rev genes (AAV-HIV vector) was used to vaccinate BALB/c mice
- A single injection stimulated and long lasting serum IgG, fecal IgA, and HIV-specific CTL
- Boosting enhanced the humoral response, and IL-2 enhanced T-cell immunity

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Env( ) Env( ) Vaccine murine(H-2^d) [Gonzalo (1999)]

Vaccine: *Vector/type:* influenza, vaccinia *Strain:* IIIB *HIV component:* V3, Env

- The use of two different live vectors for priming and boosting has a synergistic effect on the immune response against HIV-1 – a 5-6 fold enhanced CTL response in Balb/c mice occurred when they were immunized with rec influenza virus (Flu-Env) expressing the V3 loop epitope from HIV-1 strain IIIB, and boosted with a vaccinia virus recombinant (VV-Env) expressing the complete HIV-1-IIIB env protein, comared to either immunogen alone

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Env( ) Env( ) none Vaccine murine(H-2^d) [McGettigan (2001)]

Vaccine: *Vector/type:* rabies virus *Strain:* NL4-3, 89.6 *HIV component:* gp160

- BALB/c were immunized with a replication competent recombinant rabies virus (RV) vaccine expressing HIV-1 gp160
- A single vaccination induced induced strong and long-lasting (4.5 months) gp160-specific CTL cytotoxic responses
- Although the greatest specific lysis was achieved when the vaccine strain was also used as the *in vitro* the target strain to assess the response, there was extensive CTL cross-reactivity against other B clade HIV-1 envelope proteins, implying CTL recognition of multiple epitopes within the HIV-1 envelope protein

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Env( )	Env( )	SIV Nef and Env CTL epitopes	SIV infection	Rhesus macaque(Mamu-A*11, -B*03, -B*04, and -B*17)	[Dzuris (2000)]

- Cell binding assays for Mamu molecules were employed to describe the peptide binding motifs for Mamu-A*11, -B*03, -B*03, -B*04, and -B*17 CTL epitopes – a similarity for Mamu-A*11 and -B*03 and human HLA-B*44 and -B*27, respectively, was observed – all epitopes studied were SIV epitopes, so not specifically listed here

Env( )	gp120(303–327)	HIV-1 infection	human(A2, A3, A11, B27)	[Ferrari (2000)]

- One of the 51 HIV-1 epitopes selected by Ferrari *et al.* as good candidate CTL epitopes for vaccines by virtue of being conserved and presented by common HLA alleles
- For this cluster of epitopes spanning the tip of the V3 loop, they suggest including a sequence from each clade